



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/743,941	12/23/2003	Hui-Ling Lou	MP0354	9405
26703	7590	01/02/2008	EXAMINER	
HARNESS, DICKEY & PIERCE P.L.C.			BURD, KEVIN MICHAEL	
5445 CORPORATE DRIVE			ART UNIT	PAPER NUMBER
SUITE 200			2611	
TROY, MI 48098			MAIL DATE	DELIVERY MODE
			01/02/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/743,941	LOU ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Kevin M. Burd	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1)  Responsive to communication(s) filed on 27 November 2007.

2a)  This action is **FINAL**.                            2b)  This action is non-final.

3)  Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## **Disposition of Claims**

4)  Claim(s) 1-147 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5)  Claim(s) \_\_\_\_\_ is/are allowed.  
6)  Claim(s) 1-147 is/are rejected.  
7)  Claim(s) \_\_\_\_\_ is/are objected to.  
8)  Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

9)  The specification is objected to by the Examiner.

10)  The drawing(s) filed on \_\_\_\_\_ is/are: a)  accepted or b)  objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)  The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a)  All    b)  Some \* c)  None of:  
1.  Certified copies of the priority documents have been received.  
2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3.  Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)  Notice of References Cited (PTO-892)  
2)  Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3)  Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4)  Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.  
5)  Notice of Informal Patent Application  
6)  Other: \_\_\_\_\_.  
\_\_\_\_\_

1. This office action, in response to the after final amendment filed 11/27/2007, is a non-final office action.

***Response to Arguments***

2. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.
3. Applicant's arguments with respect to claims 1-147 have been considered but are moot in view of the new grounds of rejection.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-6, 8, 13, 19-21, 24-27, 29, 34, 40-43, 46-52, 54, 59, 65-67, 70-73, 75, 80, 86-86, 92-98, 100, 105, 111-113, 116-119, 121, 126, 132-135, 138, 140 and 143-145 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dacosta (US 2004/0190528) in view of Edwards et al (US 2004/0059825).

Regarding claims 1-6, 8, 13, 19-21, 24-27, 29, 34, 40-43, 46-52, 54, 59, 65-67, 70-73, 75, 80, 86-86, 92-98, 100, 105, 111-113, 116-119, 121, 126, 132-135 and 138, Dacosta discloses a wireless communication device for a MIMO wireless communication system shown in figure 1A. The device comprises at least two antennas.

Dacosta discloses embodiments of the invention are applicable to a variety of wireless networks such as a revised IEEE 802.11 standard "Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications (IEEE 802.11, 1999) (paragraph 0021). The apparatus comprises the MAC device that dynamically allocates bandwidth to client devices of a network based on utility functions to optimize the overall system utility (paragraph 0027). The bandwidth being referred to is typically the actual usable bandwidth for application-level data after taking into account error rates. However, embodiments are also applicable when the bandwidth being referred to is the raw data rate of the network link or some other estimate of network throughput (paragraph 0027). The allocation of the bandwidth is determined based on the utility functions defined for each of the applications and the function specifies the minimum amount of bandwidth required to perform at a pre-determined quality level (claims 1 and 3). Network links that are particularly unreliable, for example those with unusually high packet error rates, may be penalized since they may be regarded as wasteful of total bandwidth (paragraph 0072). The IEEE 802.11 standard has an inherent correlation measurement take place. Spread spectrum communication will conduct a correlation to indicate the proper signal is received at the expected time. For example, in CDMA, the received signal will be correlated with the expected spreading code to recover the information. This spreading code will be unique to the channel and this despreading is necessary prior to adjusting a number of channels. Dacosta does not explicitly disclose the link adaptation module is found in a MAC device. Edwards discloses medium access control in a wireless network. A link quality assessment process uses MAC based hardware components

and works in the MAC layer. It is effective with any target station and should have an insignificant effect on data throughput (paragraph 0084). Software MAC components also determine the transmit power and data rate at which the link is viable (paragraph 0083). For these reasons, it would have been obvious for one of ordinary skill in the art at the time of the invention to utilize the MAC layer device disclosed by Edwards in the device of Dacosta.

Regarding claim 139, the MAC device in the MIMO system allocates the bandwidth according to a rich scattering environment.

Regarding claim 140, Dacosta discloses links that are particularly unreliable can be dropped during the allocation of bandwidths (paragraph 0072). This link is operating in an unreliable environment.

Regarding claim 143, Dacosta discloses links that are particularly unreliable can be dropped during the allocation of bandwidths (paragraph 0072). When the link becomes more reliable, the link will be added during the allocation of bandwidths if the utility function is required.

Regarding claims 144 and 145, MIMO terminals transmit multiple independent data streams from a number of transmit antennas. If the propagation environment has sufficient scattering, the MIMO receiver processing techniques efficiently exploit the spatial dimensionality of the MIMO channel. This allows for increased data rates, increasing the capacity and bandwidth of the link. When there is not sufficient scattering, the reverse is true and the link will become unreliable.

5. Claims 7, 9, 11, 12, 14-18, 22, 23, 28, 30, 32, 33, 35-38, 44, 45, 53, 55, 57, 58, 60-64, 68, 69, 74, 76, 78, 79, 81-85, 90, 91, 99, 101, 103, 104, 106-110, 114, 115, 120, 122, 124, 125, 127-131, 136, 137, 141, 142, 146 and 147 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dacosta (US 2004/0190528) in view of Edwards et al (US 2004/0059825) further in view of Walton (2005/0002468).

Regarding claims 7, 14, 16-18, 22, 23, 28, 35, 37, 38, 44, 45, 53, 60, 62, 63, 68, 69, 74, 81, 83, 84, 90, 91, 99, 106, 108, 109, 114, 115, 120, 127, 129, 130, 136, 137, 141 and 142, the combination of Dacosta and Edwards does not disclose the MAC device comprises a space-time processor and adjusting an amount of spatial multiplexing (spatial diversity) by the space time processor. Walton discloses the MIMO system employs various forms of spatial diversity (paragraph 0029) and discloses switching between different communication modes (paragraph 0030) according to the conditions of the communication link. The different communication modes include a MIMO mode and a diversity mode that is determined when data rate requirements are low or when the SNR is low (paragraph 0030). Walton further discloses space-time processing (figure 3 block 310). It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Walton into the combination of Dacosta and Edwards to aid in overcoming the link conditions stated above.

Regarding claims 9, 11, 12, 15, 30, 32, 33, 36, 55, 57, 58, 61, 64, 76, 78, 79, 82, 85, 101, 103, 104, 107, 110, 122, 124, 125, 128 and 131, the combination of Dacosta and Edwards discloses the correlation measurement is the inherent correlation that

takes place in a spread spectrum communication system. The combination does not disclose the correlation measurement is a rank of a channel matrix or an RSSI. Walton discloses ranking the SNR values received and further decoding these signals to recover the transmitted data (paragraph 0061). Walton discloses receiving the signal power of the received signal (paragraph 0203). Walton further discloses receiving a SNR value and adjusting the coding and modulation scheme accordingly. Walton carries out these measurements to change the maximum data rate that may be transmitted on the transmission channels for the required level of performance (paragraph 0028). This will allow the overall system to be optimized. For this reason, it would have been obvious for one of ordinary skill in the art to combine the teachings of Walton into the combination of Dacosta and Edwards. In addition, Dacosta discloses one possible consequence of high error links, where the link is dropped during allocation of bandwidths to various links (when raw data rate is the bandwidth for links) (paragraph 0072). These adjustments to the specific links can prevent the links from being dropped.

Regarding claims 146 and 147, MIMO terminals transmit multiple independent data streams from a number of transmit antennas. If the propagation environment has sufficient scattering, the MIMO receiver processing techniques efficiently exploit the spatial dimensionality of the MIMO channel. This allows for increased data rates, increasing the capacity and bandwidth of the link. When there is not sufficient scattering, the reverse is true and the link will become unreliable.

6. Claims 10, 31, 56, 77, 102 and 123 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dacosta (US 2004/0190528) in view of Edwards et al (US 2004/0059825) further in view of Walton (2005/0002468) further in view of Kitchener et al (US 2002/0085643).

Regarding claims 10, 31, 56, 77, 102 and 123, the combination of Dacosta and Edwards discloses the correlation measurement is the inherent correlation that takes place in a spread spectrum communication system. The combination does not disclose the correlation measurement. Walton discloses a MIMO system employing various forms of spatial diversity (Walton; paragraph 0029) and discloses switching between different communication modes (Walton: paragraph 0030). The different communication modes include a MIMO mode and a diversity mode that is determined when data rate requirements are low or when the SNR is low (Walton: paragraph 0030). It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Walton into the combination of Dacosta and Edwards to aid in overcoming the link conditions stated above. The combination of Dacosta, Edwards and Walton does not explicitly disclose the correlation measurement is an angle of arrival. Kitchener discloses the term "spatial diversity" is used herein to refer to the use of antenna spacing to obtain signals with low correlation for fast fading. The antenna spacing required for low correlation depends on angle of arrival and angle spread of the multipath. The lower the angle spread, the greater spacing required (paragraph 0056). The antenna spacing will contribute to the interference in the signal and therefore the SNR. It would have been obvious for one of ordinary skill in the art at the time of the

invention to combine the teaching of Kitchener into the combination of Dacosta, Edwards and Walton. The definition of "spatial diversity" explicitly discloses the angle of arrival as a correlation measurement used in a MIMO system and this value will contribute to the SNR value computed.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M. Burd whose telephone number is (571) 272-3008. The examiner can normally be reached on Monday - Friday 9 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Payne can be reached on (571) 272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
KEVIN BURD  
**PRIMARY EXAMINER**  
Kevin M. Burd  
12/27/2007